# User Manual

## *m*INT Series IO Modules

### MINT CP – MINT RS485


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MINT CP

MINT AO-8

MINT AI-8U

MINT DO-16

MINT DI-16

## Features

**Portable**
**Modbus Connectivity**
**Single Setup and Easy Handling**
**Upto 127 Modules on RS485 Network**
**Low - cost Modules for PLC – DAS Systems**
**Isolated Modules Available for Special Applications**
**LEDs for Fault Status, communication and Power Supply**
**Modules used with third party software via Modbus RTU Protocol**
**Standard software for Module Configuration, Debug and Trouble - shooting IO modules available in Universal analog inputs, analog outputs, Digital inputs, Digital Outputs, combinational Modules.**

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# Contents

# 1. INTRODUCTION

## 1.1 About the User Manual and Design Guide

This user manual describes the detail specifications functions, hardware, installation, commissioning and operation of the mint-IO product family from Masibus Automation and Instrumentation Pvt. Ltd. Masibus provides 6 types of mint - I/O modules for various applications so far. Following table is the I/O modules support list we provided for user's choice.

| MODEL | MODEL TYPE |
|---|---|
| I/O MODULES | |
| MINT-DI-16 | 16 DIGITAL INPUT MODULE INCLUDING COUNTERS |
| MINT-DO-16 | 16 DIGITAL OUTPUT MODULE |
| MINT-AI-08 | 8 UNIVERSAL ANALOG INPUT MODULE |
| MINT-AOI-08 | 8 ANALOG OUTPUT 0 - 20mA / 4 - 20mA |
| MINT-AOV-08 | 8 ANALOG OUTPUT 0 - 10V / 2 - 10V |

## 1.2 An Overview of mINT IO series:

**MINT IO** modules are innovative which provides a simple low cost solution for distributed I/O requirements. The IO system consists of stand-alone Digital and Analog - Input/output modules which are connected together on a RS485 two wire multi-drop network.

The modules communicate using the MODBUS RTU protocol. A 16-Bit controller is used in the modules to provide high speed data processing and fast communications turnaround times. Multiple baud rates are selectable from 9600 to 115200 baud.

All IO modules plug directly onto an industry standard DIN rail. All modules have a minimum isolation of 1500VAC RMS between the field and logic.

The modules have been equipped with status LED's which are used to indicate the status of Inputs or outputs.

This visual indication assists with fault finding and diagnostics.

## 1.3 Product Ordering Code:

The mint- IO has a nameplate affixed to the one side of the enclosure. Check the model and suffix codes inscribed on the nameplate to confirm that the product received is that which was ordered.

| MINT I/O | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Model | I/O Type | | AI Channel Type | | DO Type | | AO Type | | Communication | | |
| MINT | XX | | X | | X | | X | | | Port 1 | Port 2 |
| | AI-8 | 8 channel Analog Input | N | None | N | None | N | None | SS | RS485 | RS485 |
| | DI-16 | 16 channel Digital Input | 0 | Non Isolated | 0 | Sink Type | I | Current o/p | SE | RS485 | Ethernet |
| | AO-8 | 8 channel Analog Output | | | 1 | Source Type | V | Voltage o/p | SP | RS485 | Profibus |
| | DO-16 | 16 channel Digital Output | | | | | | | | | |

| MINT – Analog Input / Output – Master/Slave (RS485) | | |
|---|---|---|
| Model | AO Type | |
| MINT AI/AO-MS | X | |
| | I | Current o/p |
| | V | Voltage o/p |

| MINT – Digital Input / Output – Master/Slave (RS485) | | |
|---|---|---|
| Model | DO Type | |
| MINT DI/DO-MS | X | |
| | 0 | Sink Type |
| | 1 | Source Type |

| MINT CP | |
|---|---|
| Model | MINT CP |

## 1.4 List Of Accessories:

The product CD for the mint Plus software contains:

- Mint plus Configuration Tool setup
- User Manual

## 1.5 SAFETY PRECAUTIONS

The product and the instruction manual describe important information to prevent possible damage to the property and to use the product safely. Understand the following description (signs and symbols), read the text and observe Descriptions.

| | |
|---|---|
|  **Warning** | This indicates a damage of product if not avoided. |

### 1.5.1 General Note

The user manual, the accompanying texts and the documentation are written for the use of the products by qualified personnel. When using the products, all safety instructions and all valid legal regulations have to be followed. Technical knowledge is presumed. The user has to assure that all legal regulations are followed.

### 1.5.2 Personnel Qualification

The mint IOs and Gateways must only be installed configured and removed by qualified personnel. Professional qualification in the following specific areas of electrical engineering is required:

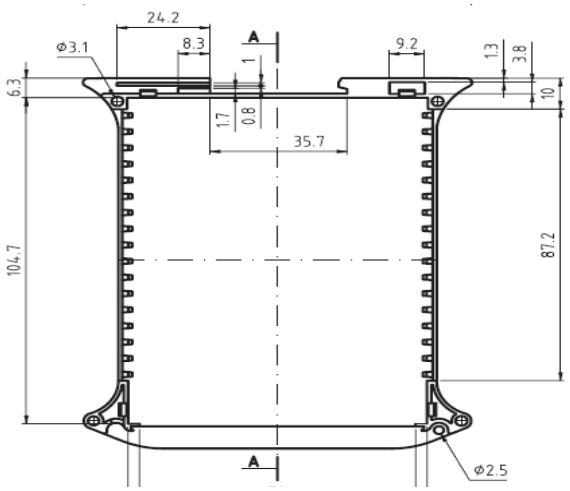
- Security and protection of health at work
- Mounting and attaching of electrical equipment
- Measurement and analysis of electrical functions and systems
- Evaluation of the security of electrical equipment

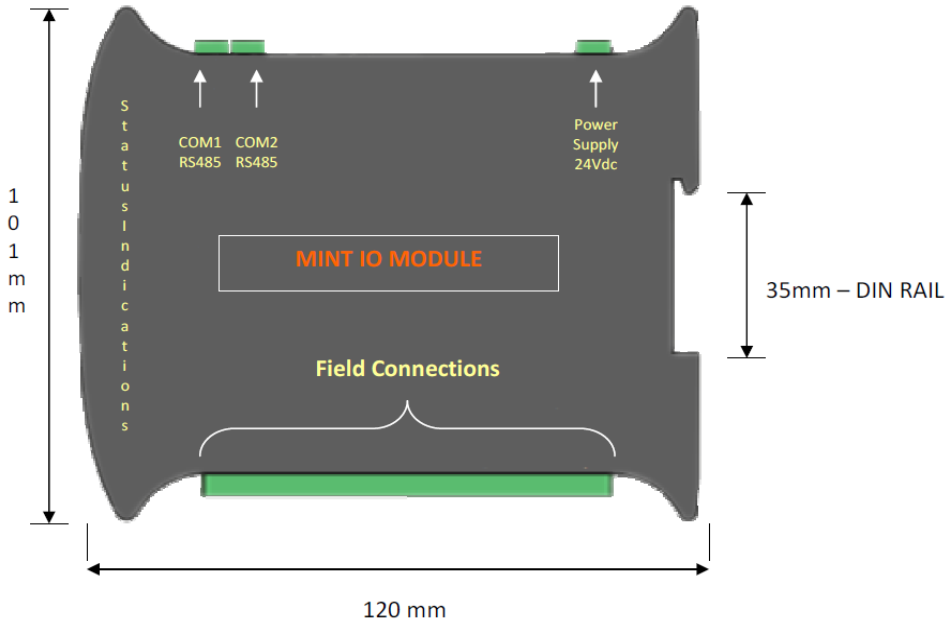
**Important:** Prior to installation and use of your device you must read and understand all instructions in this manual in order to avoid any damage.

# 2. IO GENERAL INFORMATION:

## 2.1 Physical Dimensions:

The IO enclosure is shown below. The module clips directly onto an industry standard DIN rail. Field wiring is on bottom side of the module via a separate plug in connector. The module power and RS485 communications wiring is on a separate plug in connector on the upper side of the housing.



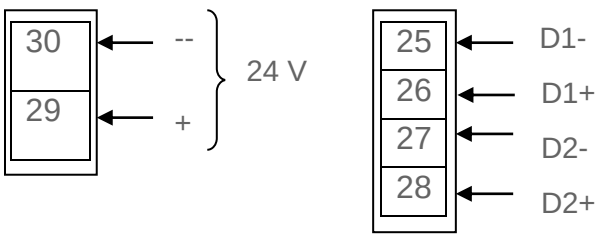




**Mechanical Specifications**

| | |
|---|---|
| **Module** | |
| **Case** | ABS Plastic |
| **Width** | 22.5 mm |
| **Height** | 101 mm |
| **Depth** | 120 mm |
| **Color** | Black |
| **Weight** | 160g |
| **Mounting** | Suitable for DIN rail in compliance with EN-50022 |

### Connection Detail:

Power Supply and RS-485 port connections are as following:



 **Warning:** Failure to follow improper installation practice of RS485 wiring and power supply wiring may cause failure of IO modules, specifically communication failures.

## 2.2 Grounding/Shielding

In most cases, mint-IO modules will be installed in an enclosure along with other devices which generate electromagnetic radiation. Examples of these devices are relays and contactors, transformers, motor controllers etc. This electromagnetic radiation can induce electrical noise into both power and signal lines, as well as direct radiation into the module causing negative effects on the system. Appropriate grounding, shielding and other protective steps should be taken at the installation stage to prevent these effects. These protective steps include control cabinet grounding, module grounding, cable shield grounding, protective elements for electromagnetic switching devices, correct wiring as well as consideration of cable types and their cross sections.

## 2.3 RS485 Network Wiring

RS485 is designed to be used with a single twisted pair cable. One of the restrictions of this system is that the common mode voltages of the nodes on the network should not exceed -7V or +10V. In order to ensure that this condition is met, it is recommended that the 0V connections on the modules be connected together. For modules that are far apart, a second twisted pair should be used as the 0V link. In certain applications where there are strong possibilities of an earth loop being caused by the 0V link, the link should be tied to the 0V terminal on each module through a 100ohm resistor, to limit the earth loop current. Where earth loop problems exist, it may be necessary to isolate the RS485 network either using optical fiber or an isolated RS485 repeater.

### 2.3.1 RS485 Cabling Methodology

**Method-1, Single Twisted pair, No shield**

In this case, “Earth” is ground and it is inexpensive, easy to install. This kind of cabling is suitable. if conduits are used for communication cables, power supply cables are not available and environment is free from electrical noise. This method is not recommended for industrial applications.

**Method-2, Shielded single twisted pair + Earth wire**

One pair is used for RS-485 communications and extra wire used specifically for a ground wire.

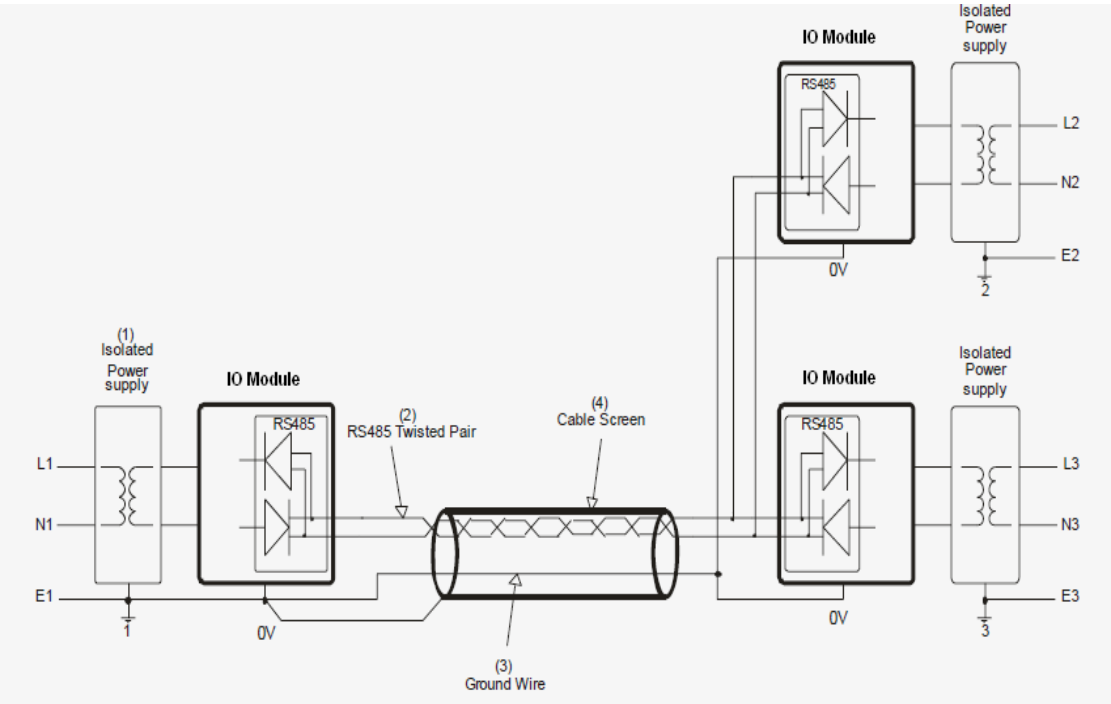
**Method-3, Shielded single twisted pair cable**

One pair is used for RS-485 communications and shield is used for return.

**Method-4, Shielded twisted pair, 2 pairs**

One pair is used for the RS-485 communications and another pair is used for ground Method 2 to 4 would reduce noise induced through ground potential differences. This is the preferred option in areas where there is a potential for high electrical noise or if cabling lacks the cleanliness of conduit or wire trays.

The drawback of the three conductor option is elevated cable pricing and is slightly more difficult to install. Care must also be taking using this option not to create a ground loop.




**Note:** *Ground on IO module is Pin 30 at 24V Power supply connector which is 0V or "-"V*.

**Good installation practice for RS485 systems:**

- Use isolated power supplies to ensure that the IO modules are not earthed. Only one module on the network should be earthed. (Module1).
- Use RS485 shielded twisted cable to prevent electrical noise pickup.
- Use a ground wire to connect all of the 0V terminals on the modules together. This will ensure that all of the modules are at the same potential. The ground wire must be earthed at Module1 only.
- Use a screened cable to prevent electrical noise pickup. This screen must be earthed at one end only, Module1. If a ground wire is not available then the screen can be used instead. To get the best performance this is not recommended.
- The RS485 and power supply is wired correctly.
- Do not carry RS485 and 24V DC power supply in same cables.
- Use Separate isolated 24V DC for RS485 devices power supply and field inputs.
- The 0V of the power supply must be earthed.
- The screen of the RS485 cable must be earthed.
- The RS485 devices must be at the same earth potential.

- Use optical isolators in RS485 line to provide protection from low frequency interference from ground loops.
- Do proper termination and/or shielding to provide isolation from high frequency interference, RFI, and transients.
- The power supply must have good filters and protection on the 220V/110V side.
- The RS485 line should have external over voltage protection to protect from high voltage electrical noise being induced into the RS485 cable.
- Make sure there is dedicated Instrumentation ground system to be used with RS485 devices

### 2.4 Switch settings:

| S1 | S2 | S3 | S4 | S5 | S6 | S7 | S8 | S9 | S10 |
|---|---|---|---|---|---|---|---|---|---|
| +1 | +2 | +4 | +8 | +16 | +32 | +64 | BD | X1 | X2 |

▲

### 2.4.1 Setting the Modbus Node ID

Each module uses register 32010 to store the status of the DIP switches.

| Switch | Function | Description |
|---|---|---|
| S1 | Node ID +1 | Node ID's from 0 to 127 are set up using switches 1 to 7 |
| S2 | Node ID +2 | " |
| S3 | Node ID +4 | " |
| S4 | Node ID +8 | " |
| S5 | Node ID +16 | " |
| S6 | Node ID +32 | " |
| S7 | Node ID +64 | " |
| S8 | BD | If ON then default comm. parameter. |
| S9 | X1 | Termination Resister 1 for RS-485 port 1 |
| S10 | X2 | Termination Resister 2 for RS-485 port 2 |

### 2.4.2 RS- 485 Termination:

If DIP Switch 9 is "ON" then Termination resistance for Com port 1 is "ON"
If DIP Switch 10 is "ON" then Termination resistance for Com port 2 is "ON"

### 2.5 Communication Settings:

The data in the modules is stored in 16 bit registers. These registers are accessed over the Network using the MODBUS **RTU** communication protocol.

### 2.5.1 Communications Settings with DIP Switch 8 ON (Default):

Baud rate : 9600
Parity : None
Data length : 8
Stop bits : 1

### 2.5.2 Communications Settings with DIP Switch 8 OFF(Programmed Baud Rate):

Baud rate : 9600, 19200, 38400, 57600, 115200
Parity : None, even, odd
Data length : 8
Stop bits : 1, 2

These communication settings are done from mINT configuration software or any MODBUS Master software. After changing these parameters, Module must restart to take the effect of changed parameter.

### 2.5.3 Communications Settings Registers

| Address | Parameter | Min value | Max Value | Description |
|---|---|---|---|---|
| **COM1** | | | | |
| 42001 | Slave ID | 1 | 127 | Read Only Parameter |
| 42002 | Baud rate | 1 | 5 | 1 = 9600,<br>2 = 19200,<br>3 = 38400,<br>4 = 57600,<br>5 = 115200 |
| 42003 | Parity | 0 | 2 | 0 = None,<br>1 = Even,<br>2 = Odd |
| 42004 | Stop Bits | 1 | 2 | 1 = 1 Stop bit,<br>2 = 2 Stop bits |
| 42005 | Data Length | 8 | 8 | 8 = 8 Data Bits |
| **COM2** | | | | |
| 42006 | Slave ID | 1 | 127 | Read Only Parameter |
| 42007 | Baud rate | 1 | 5 | 1 = 9600,<br>2 = 19200,<br>3 = 38400,<br>4 = 57600,<br>5 = 115200 |
| 42008 | Parity | 0 | 2 | 0 = None,<br>1 = Even,<br>2 = Odd |
| 42009 | Stop Bits | 1 | 2 | 1 = 1 Stop bit,<br>2 = 2 Stop bits |
| 42010 | Data Length | 8 | 8 | 8 = 8 Data Bits |

**Slave ID Registers (42001 & 42006):**

The slave ID value is Modbus device address of IO module which is configured by changing DIP switch. It is read only parameters.

**Baud Rate Registers (42002 & 42007):**

The baud rate of com1 or com2 can be set to 9600 by writing a 1, set to 19200 by writing a 2, set to 38400 by writing a 3, set to 57600 by writing a 4 or set to 115200 by writing a 5 to the 42002 or 42007 register.

**Parity Register (42003 & 42008):**

The parity of com1 or com2 can be set to none by writing a 0, set to even by writing a 1 or set to odd by writing a 2 to the parity 42003 or 42008 register.

**Stop Bits Register (42004 & 42009):**

The number of stop bits of com1 or com2 can be set to 1 by writing a 1 or set to 2 by writing a 2 to the stop bits Register 42004 or 42009.

**Data Length Register (42005 & 42010):**

The data length register of com1 and com2 is 8. These parameters are read only.

For ex: If you want set baud rate of communication port one, enter the required value in the register 42002. Set all the parameters once and then switch off the power supply to the IO Module. Now switch on the Dip switch 8 on the module to make above settings effective, then, user defined communication settings will be effective instead of default communication settings from factory. After power on, the IO Module will have new Communication settings. Please note that at this point of time, IO module may not communicate with PC because you may have different settings at RS232/RS485 converter and also COM port settings in the PC.

### 2.5.5 Modbus Register Types

There are 4 types of variables which can be accessed from the module. Each module has one or more of these data variables.

Type Start Address Variable Access

- 00001 Digital Outputs Read & Write
- 10001 Digital Inputs Read Only
- 30001 Input registers (Analog) Read Only
- 40001 Output registers (Analog) Read & Write(Holding type)

**Note:** *The Modbus message length must be limited to 100 consecutive read or write registers. If more registers are required then a new poll group must be added for the next xxx registers.*

# 3. MINT-CP MODULE

## 3.1 mINT CP Ethernet Interface Module

### 3.1.1 Description

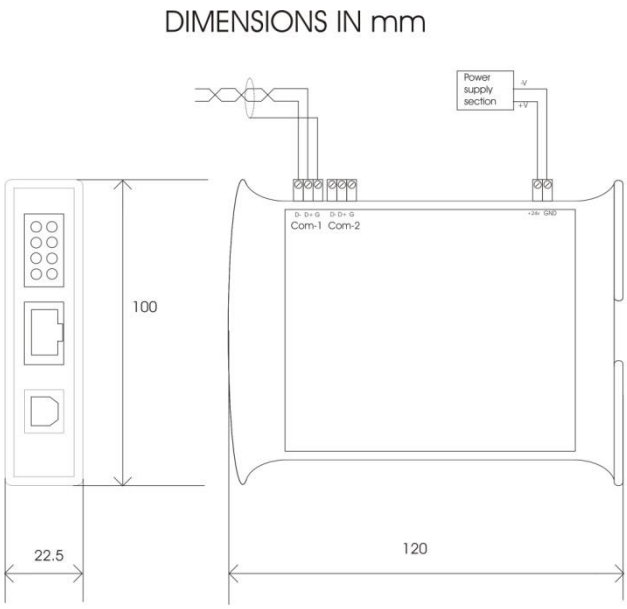
The mint CP is works as Ethernet to serial convertor and connects mint IOs to Ethernet network.

Mint CP includes a web server which enables access to internal parameters for configuration. This allows IP address configuration, default gateway IP address and subnet mask. The web server can be accessed by most web browsers.

Factory default IP address is:

192.168.100.110

This address can be change by existing network through browser.




The web page address for viewing the setup parameter is http:// 192.168.100.110. The master device which is polling the IO-modules must be configured with IP address of the Mint-CP module and with the modbus ID of the mint-IO modules. As each IO modules communication bus is separate, it is possible to have repeated Modbus ID's on the mint-IO modules provided they are attached to a different mint-CP. The IP address differentiates between the different mint systems. Consequently, many hundreds of mint-IO modules may be added to a Ethernet network.

The mint-CP is a Modbus gateway and the client must be configured to use Port 502. This is a reserved port number for Modbus TCP applications and informs the mint-CP that it must implement the protocol conversion from Modbus TCP on the Ethernet network to Modbus RTU on the mint-CP serial communications bus.

### 3.1.2 Technical Specification of mINT CP

| Voltage Requirements: | |
|---|---|
| Logic Supply voltage | 18 - 32Vdc |
| Logic Supply Current | 100mA max @24V |
| Power Consumption | < 2.5W |
| **Ethernet port Specifications:** | |
| Network interface | Ethernet 10/100Base-T(auto-detecting) |
| Connector | RJ45 connection (auto-crossover) |
| Protocols | TCP/IP, ARP, UDP,DHCP, Modbus TCP/IP, HTTP |
| NO of Client for Modbus TCP/IP | Up to 15 |

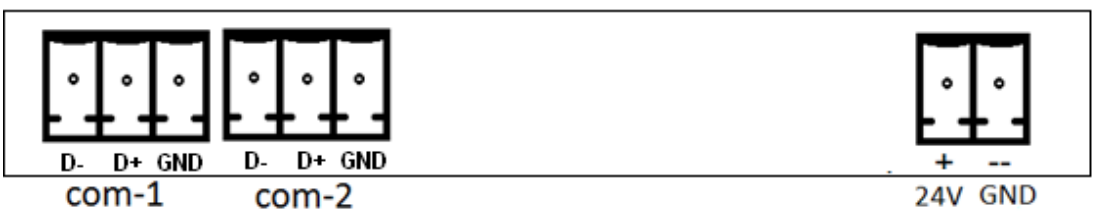
| Performance Specifications | |
|---|---|
| Processor | 32-bit CPU ARM Core |
| Maximum No. of Read Registers | 1024 |
| Maximum No. of Write Registers | 1024 |
| Configuration and Diagnostics | mINT-Plus software |
| No. of mINT-IO support | Up to 15-mINT-IOs |
| **Serial Port Specifications:** | |
| Communication Port | RS485 port 1 & 2 (D+, D-, GND) (2-wire half-duplex) |
| Communication Speed(Baud rate) | 9600, 19200, 38400, 57600,115200 bps. |
| Parity | ODD, EVEN ,NONE |
| Data bits | 8 |
| Stop bit | 1, 2 |
| Protocols | Modbus RTU master |
| Diagnostic Port | USB 2.0 – Modbus RTU slave |
| **Environmental Specifications:** | |
| Operating Temperature | 0˚ C to 55˚ C |
| Storage Temperature | -10˚C to 70˚ C |
| Humidity (Non-condensing) | 30 to 95% RH |

### 3.1.3 Status Indicators


1. Power supply: indicates power supply is been provided.
2. Status: Indicates healthy condition of microcontroller.
3. Diagnostic: Indicates direct configuration with CP or IO.
4. Memory: Indicates data communication with flash memory
5. Uart-1 Rx: Indicates data received at com port 1
6. Uart-1 Tx: Indicates data transmitted from com port 1
7. Uart-2 Rx: Indicates data received at com port 2.
8. Uart-2 Tx: Indicates data transmitted from com port 2.

### 3.1.4 Wiring

Following diagram shows the wiring of the power supply and RS-485 Connection.



### 3.1.5 Configuration

Mint-CP module configuration is done by mint-plus configuration software. Refer to the section in the mint-plus configuration software guide. The configuration of the IP Address is also done using the web browser.

#### 3.1.5.1 Power configuration

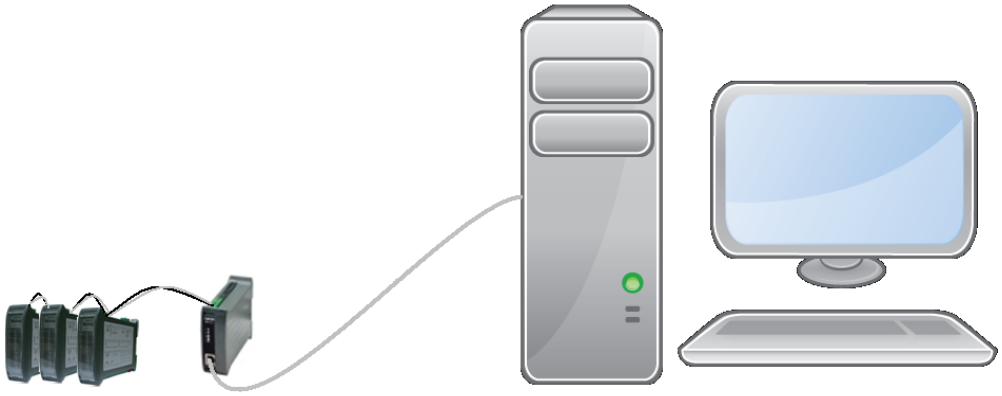
mINT CP must be applied to terminal 2 (+24VDC) and terminal 1 (0V). The power LED will flash and all LED's will be off.

#### 3.1.5.2 Ethernet configuration

Ethernet connection is required, either through a network or directly to a PC. For Ethernet connection standard RJ45 connector is used.

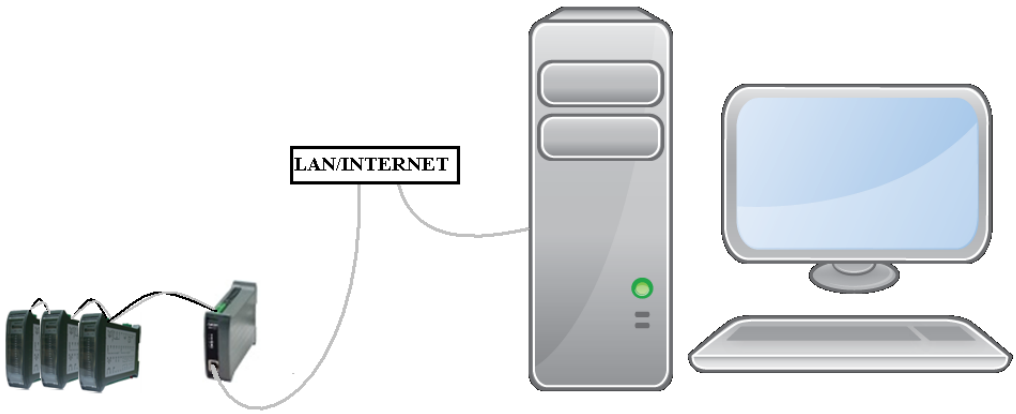
### 3.1.5.3 Direct connect to the PC

If PC is not connected to the network then PC should have an Ethernet card installed. Which help to connect mINT-CP module to direct connect to the PC using simple Ethernet cable (RJ45). The mINT CP is shipped with a default IP address 192.168.100.110. This address is in the address area reserved for local networks not connected to the internet.



### 3.1.5.4 Connect to PC via Ethernet/LAN

If any Ethernet network is available, the mINT CP can be connected to any Ethernet connection or hub belonging to the network. If the PC is connected to a network, there is a possibility that the default IP address of the mINT CP is outside the range of the network (address does not belong to the IP subnet to the network). In this case local network administrator can assign new or free IP address to the mINT CP. mINT CP has also in built DHCP/static protocol for free IP allocation. The new IP address is programmed into mINT CP using any standard web browser software.



### 3.1.5.5 Viewing web pages and configure parameters.

The mINT CP is configurable through mINTPLUS software. This is used for changing Ethernet configuration. Note - Factory Set IP -192.168.100.110.

If no MINT CP detected, go back to testing the network connection to the mINT CP by using the ping command. If the mINT CP replies to the ping messages, check the setup of the MintPLUS. If it is directly connected to the same network as the PC," Direct connection to the network" or "by pass proxy server for local addresses". If the CP is connected to the PC through a firewall, a proxy server should be selected in the configuration menu. Contact the local network administrator for information about the network configuration.

This Window allows you to change the IP address of the mINT CP, Default Gateway, and Subnet Mask, manually as well as DHCP/auto.

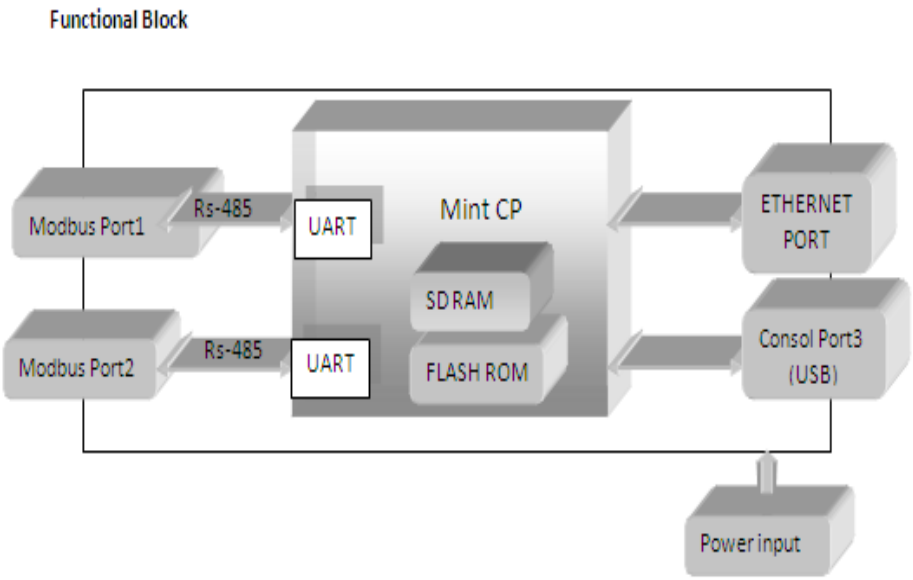
**IP Address**: The new IP address can be entered into the web page as shown above. After this has been done, you must click the Submit button to send the values to the MINT CP. The screen will now be updated and if successful will continue to display the new IP address. The new IP address will only be effective after the MINT CP power has been switched off and on again. This feature allows you to check that the correct IP address has been entered before being activated. If the IP address has been entered incorrectly and the power has not been switched off, it is possible to re-enter the correct IP address. If the power has been switched off and back on again, the MINT CP will not communicate until you enter the new IP address into the address line of the browser window.

**Default Gateway IP Address**: A default gateway is a node (a router) on a computer network that serves as an access point to another network. In enterprises, however, the gateway is the computer that routes the traffic from a PC to the outside network that is serving the Web pages. It is only necessary to configure the default gateway IP address if the PC that is accessing the MINT CP is on a different network.Note-Factory Set 192.168.100.254

**Subnet Mask**: In computer networks, a subnet work or subnet is a range of logical addresses within the address space that is assigned to an organization. The subnet mask is used to inform the MINT CP that it must send its replies to the gateway if the IP address of the PC is on a different network. When the subnet mask is set to "0.0.0.0" then it is effectively disabled and the default gateway is not used. A typical subnet mask would be "255.255.255.0". Note-Factory Set 255.255.255.0

**Restore factory defaults** option is will restore all the IP, gateway and subnet mask to their default value.

### 3.1.6 Functional block

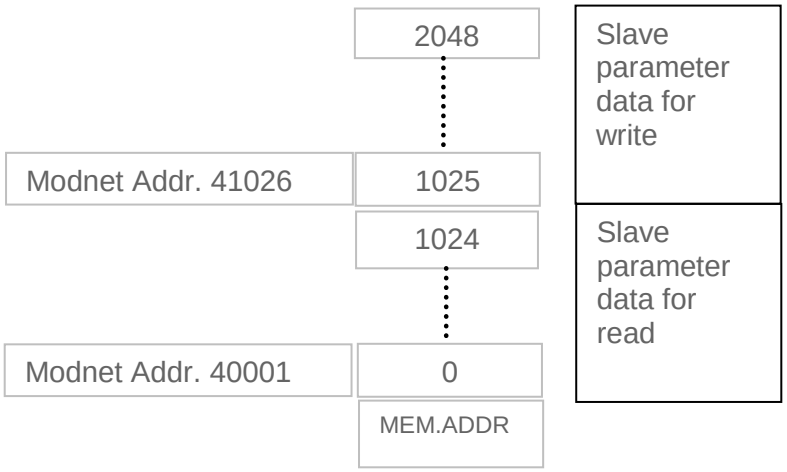



## 3.2 Data addressing and memory mapping

### 3.2.1 Configuration for mINT-IOs

Configured mint IOs are addressed according to their variables, which are represent whether read or write. Each variable occupies 5 addresses. For all variables, base address is 44001. MINT CP can handle either 100 Queries maximum or 1024 Read + 1024 write registers.

**Data memory address:** all parameter read and write data are stored in the mINT CP. Starting address for this parameter data is described in the table.




As shown in figure, data for slave parameters for read, store from starting address 0 to 1025 with the base address of 40001 and data for slave parameters for write, store from starting address 1 to 1025 with the base address of 41026.

### 3.2.2 mINT CP configuration address

User can configure serial communication and Ethernet communication at addresses shown in following table.

| Address | Parameter | Min value | Max Value | Description |
|---|---|---|---|---|
| **COM1** | | | | |
| 45001 | Baud rate | 1 | 5 | 1 = 9600(Default),<br>2 = 19200,<br>3 = 38400,<br>4 = 57600,<br>5 = 115200, |
| 45002 | Parity | 0 | 2 | 0 = None(Default),<br>1 = Even,<br>2 = Odd |
| 45003 | Stop Bits | 1 | 2 | 1 = 1 Stop bit(Default),<br>2 = 2 Stop bits |
| 45004 | Data Length | 8 | 8 | 8 = 8 Data Bits |
| **COM2** | | | | |
| 45005 | Baud rate | 1 | 5 | 1 = 9600(Default),<br>2 = 19200,<br>3 = 38400,<br>4 = 57600,<br>5 = 115200 |
| 45006 | Parity | 0 | 2 | 0 = None(Default),<br>1 = Even,<br>2 = Odd |
| 45007 | Stop Bits | 1 | 2 | 1 = 1 Stop bit(Default),<br>2 = 2 Stop bits |
| 45008 | Data Length | 8 | 8 | 8 = 8 Data Bits |
| 45013 | Enable-COM-1 | 0 | 1 | 0 = Disable,<br>1= Enable(Default), |

| | | | | |
|---|---|---|---|---|
| 45014 | Enable-COM-2 | 0 | 1 | 0 = Disable(Default), 1= Enable |
| 45016 | IP ADDRESS – Byte 0 | 0 | 255 | Default IP Address is 192.168.100.110 |
| 45017 | IP ADDRESS – Byte 1 | 0 | 255 | |
| 45018 | IP ADDRESS – Byte 2 | 0 | 255 | |
| 45019 | IP ADDRESS – Byte 3 | 0 | 255 | |
| 45020 | Mask Address – Byte 0 | 0 | 255 | Default Mask Value is 255.255.255.0 |
| 45021 | Mask Address – Byte 1 | 0 | 255 | |
| 45022 | Mask Address – Byte 2 | 0 | 255 | |
| 45023 | Mask Address – Byte 3 | 0 | 255 | |
| 45024 | Gateway IP Address | 0 | 255 | Default Gateway Address is 192.168.100.254 |
| 45025 | Gateway IP Address | 0 | 255 | |
| 45026 | Gateway IP Address | 0 | 255 | |
| 45027 | Gateway IP Address | 0 | 255 | |
| 45028 | Port Name | 502 | 502 | Modbus TCP Port |
| 45029 | Time-Out Detect Value | 0 | 65535 | Modbus RTU Time-Out Error Value |
| 45030 | Timeout(com) | 0 | 65535 | Modbus Time out value in scale of 1ms – (Default – 1000ms) |
| 45031 | Retry(com) | 0 | 65535 | No. of Modbus query retry (default – 0) |
| 45032 | Watch(com) | 0 | 65535 | Modbus Watch Time value in scale of 1ms – (Default – 10000ms) |
| 45033 | Scan Time(com) | 0 | 65535 | Modbus Scan Time value in scale of 1ms – (Default – 10000ms) |
| 45034 | Static/Dhcp | 0 | 1 | 0 – IP address is static, 1-IP address assign by DHCP server. (Default – 0 static IP) |

**Serial communication:**

There are two **com-ports** are available for serial communication as redundancy support Modbus RTU master. User can use only one port at a time i.e. While com port 1 is in working mode(Enable) then com port 2 will be in disable mode and vice versa.

**Baud rate** with the range from 9600 to 115200 can be configuring here.

**Parity bit** for non parity 0, even parity 1 and for odd parity 2 can be configure.

Any one com-port should be configured at one instance. They work as redundancy logic. This logic changes communication link to other port for failure of one port.

**TCP/IP Ethernet communication:**

IP address, Mask and gateway are configured as per network comfort. According to factory setting, IP address is:192.168.100.110

**Port number** is by default considered as 502.

**Further configuration:**

**Delay** (com) (ms): controls the time between the receiving of single characters.

**Timeout** (com) (ms): time out occur when slave do not respond the query within this specified time. This time have to specify at this address (45030) in millisecond.

**Timeout detect value:** if slave fails to respond query before time-out, then some value should be indicate that slave respond value. This value has to be stored in this register address 45029.

**Retry** (com): it is number of retry count that the query needs to be resend on its failure.

**Watch** (com) (ms): it is a specified time, after that master resend request to the slave. It is much larger then timeout time. And it helps to reduce total query sending time.

**Scan time** (com): It scans data from the register address after completion of scan time cycle

**DHCP/Static**: the IP address to mINT CP can be allocated according to DHCP. Through which less IP address problem can be resolved.

**Security and reset:**

Masibus provides password protection for configure data and direct write.

This **password** is written in register address 45097

Using this password and assigning data 5555 to address 45099 can set **all data to zero.**

For **direct communication with the IOs**, values 0, 1 and 2 have to initialize in register 45100 for disable direct communication, via Ethernet and via USB respectively.

### 3.2.3 mINT-CP diagnostics modnet address

Fully diagnostic data of CP can be read from this range of addresses.

| Parameter | Address | Description |
|---|---|---|
| | | |
| **COM 2 State** | 32002 | 0: no error and using;<br>1: not to be used; |
| **Number of Requests** | 32101, 32102 | Total number of requests from the master<br>Unsigned 32-bit integer |
| **Number of Valid Responses** | 32103, 32104 | Total number of responses to the master<br>Unsigned 32-bit integer |
| **Number of Invalid Responses** | 32105, 32106 | Total number of responses to the master<br>Unsigned 32-bit integer |
| **Running Time** | 32107 – SECOND<br>32108 – MINUTE<br>32109 – HOUR<br>32110 – DAY | Time elapsed, in seconds<br>Unsigned 32-bit integer |
| **DIP Switch** | 32010 | Status of DIP Switch on Front Panel |
| **Software Version** | 32001, 32002 | 4 unsigned 8-bit integers |
| **Parameters Version** | 32003, 32004 | 4 unsigned 8-bit integers |
| **Software Type** | 32005,32006 | Type ID of I/O module |
| **Part Name** | 32007 -32018 | Part Name of mint-CP module. |
| com-1 status | 32019 | 0: no error and using;<br>1: not to be used; |
| com-2 status | 32020 | 0: no error and using;<br>1: not to be used; |
| IP address | 32023 -32026 | Mint-CP IP address |
| IP Mask | 32027 - 32030 | Mint-CP IP mask address |
| TCP Port | 32031 | Ethernet – Port |
| Station no | 32032 | Modnet Device ID |
| No. of request | 32033 - 34 | Modbus RTU master send request to slave |
| No. of valid-res | 32035 - 36 | Valid response for sent request from slave to master |

| | | |
|---|---|---|
| No. of invalid res | 32037- 38 | Invalid response for sent request from slave to master |
| No. of Modbus timeout | 32039-40 | Count of timeout query for each timeout |
| I/O stations' status | 32055 | Connection of slave with master is whether enable or disable |

**Software version** describes the current version of the master software, whether it is working from personal pc or PLC or SCADA. **Software type** shows the software is from PC, PLC or SCADA.

**Part name:** Part identity of slave, which is connected to the master software or PLC.

If mINT CP is connected then part name should be MINT-CP-ET-000-0 in 32007 to 32018 addresses.

**Com status:** whether comport is enabled or disabled.

This can be analyzing from address 32019 to 32020 from CP registers.

Ethernet diagnostics

**IP address:** 4 bytes of IPv4 address can diagnosis from address 32023 to 32026, from most significant Byte to least significant Byte.

**IP mask:** 4 bytes of IPv4 address can diagnosis from address 32027 to 32030, from most significant Byte to least significant Byte.

**TCP port:** port address (502) for CP communication.

**Station No:**

**No. of request:** This swap long number describes sent queries from the master CP to slave mINT IOs.

**No. of valid request:** This number shows the valid queries that responded by the slave mINT IOs.

**No. of invalid request:** This number shows the no of queries that are not qualified or do not have sufficient information, those are rejected (responded as invalid) by the slave mINT IOs.

**No. of Modbus Time-out:** As per configure value of time out at address 45030 address, count of all timed out response can be derived from address 32039 and 32040 as higher and lower Byte respectively.

**IO's station status** (32055): They show status of the slaves connected to the master (mINT CP) whether it is enabled of disabled.

**Second, min, hour, day, week day, month,** and **year** of real time clack can be observe at 32062 to 32068 addresses.

### 3.2.4 Direct IO configuration for Ethernet

This can be done with considering 49001 as base address and adding configured data address of IO (as shown in table).

| Modnet-ADDRESS | Descript |
|---|---|
| 49001 | IO-data |
| . | . |
| . | . |
| . | . |

### 3.2.5 Direct IO configuration for USB slave ID-127

| Modnet-ADDRESS | Descript |
|---|---|
| As per IO | IO-data |
| . | . |
| . | . |
| . | . |

## 4. IO modules:

### 4.1 mINT – 16DI – Digital Inputs with counters:

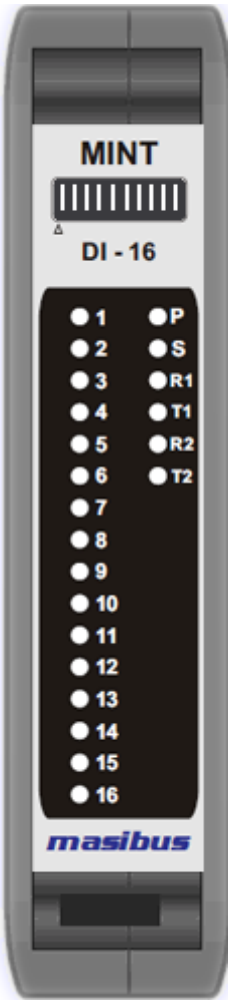
#### 4.1.1 Description:

The IO-16DI module is a 16 channel digital input module. The inputs are isolated from the logic by bi-directional O/pto-couplers. The common is connected internally to either the (-) volts or (+) volts. The inputs have internal counters associated with them. These counters are 32 bit Counters allowing a count value from 0 to 4294967295. The count value can be cleared by writing a zero to the associated registers or preset to any other value using the same method.

#### 4.1.2 Technical Specifications:

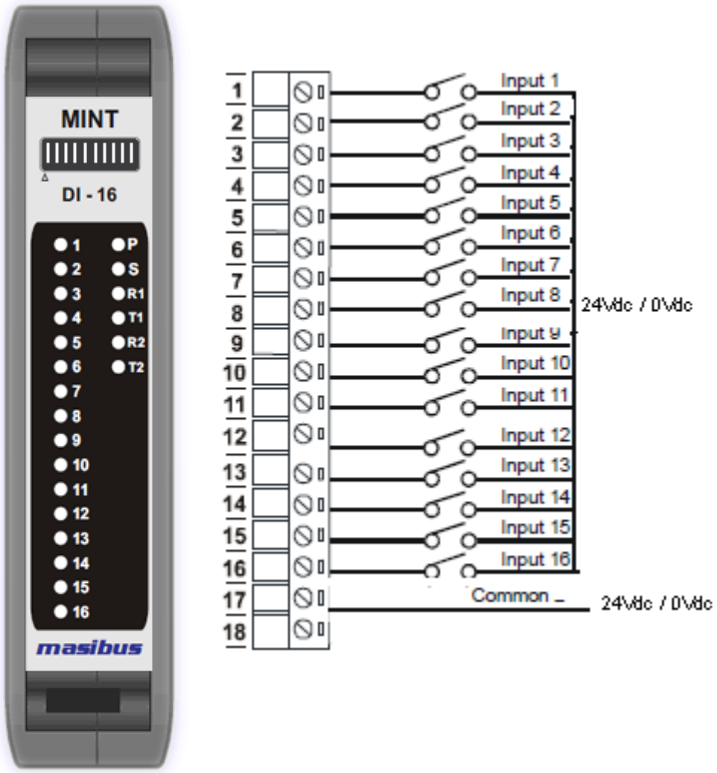
| Voltage Requirements: | |
|---|---|
| Logic Supply voltage | 18 - 32Vdc |
| Logic Supply Current | 50mA max @24V |
| Power Consumption | < 2W |
| **Input Specifications:** | |
| Input Points | 16 |
| Maximum Input Voltage | 36 Vdc |
| Input Current | 11mA @ 24Vdc |
| Turn ON Voltage | 15-24Vdc |
| Turn OFF Voltage | 0-8Vdc |
| Minimum Input Pulse Width | 500 uSeconds |
| Frequency Counter | 1 Khz Max |
| Counter Resolution | 32bit |
| Filter time (ms) | 0 - 65535 mSeconds |
| Debounce Time (ms) | 0 - 65535 mSeconds |
| Chatter Filter Time | 0 - 65535 mSeconds |
| Chatter Filter Counts | 0 - 250 Counts |
| Isolation | 1500Vrms – Field To Logic |
| Isolation | 1500Vrms – Logic To RS485 |
| Isolation | 1500Vrms – RS485 To Field |
| **Environmental Specifications:** | |
| Operating Temperature | 0˚ C to 55˚ C |
| Storage Temperature | -10˚C to 70˚ C |
| Humidity (Non-condensing) | 30 to 95% RH |
| **Communication Specifications:** | |
| Communication Port | 2 COM ports |
| Communication Interface | Based on EIA RS-485. |
| Communication Speed(Baud rate) | 9600, 19200, 38400, 57600,115200 bps. |
| Parity | ODD, EVEN ,NONE |
| Data bits | 8 |
| Stop bit | 1, 2 |
| Communication Protocol | Modbus RTU |

### 4.1.3 Status Indicators

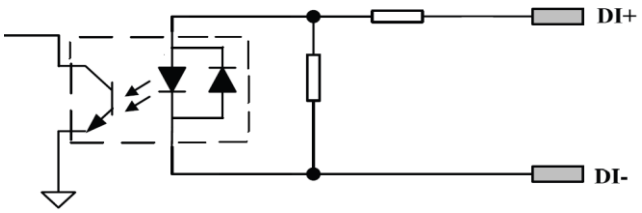



- Power: "ON" When Logic Supply is "ON"
- Module Status: "ON" When CPU is Running
- RS 485 RX1- RX2: Flashes when Modbus queries are receiving
- RS 485 TX1- TX2: Flashes when transmitting Modbus response
- Input Status: "ON" when Input is "ON"
  "OFF" when Input is "OFF"

### 4.1.4 Wiring Diagram for mINT – 16DI – Digital Inputs:




Equivalent Circuit Diagram:




### 4.1.5 Input Processing – Filtration

#### 4.1.5.1 Latch High:

If the channel is in the OFF state and then the ON signal is received, the ON state will be latched. This state continues until it is forced OFF by user

#### 4.1.5.2 Latch Low:

If the channel is in the ON state and then the OFF signal is received, the OFF state will be latched. This state continues until it is forced OFF by user.

#### 4.1.5.3 Counter Registers:

The counter registers display two 16 bit registers. The first register is the High Register and the second register is the Low Register. To get the actual 42 bit count value the registers must be combined as follows:

Counter High Value = Register 40001.
Counter Low Value = Register 40002.
Counter Value = (Counter High Value X 65535) + Counter Low Value.

### 4.1.5.4 Counter Capture:

To capture a counter a BIT value must be written to the corresponding channel number in the Counter Capture Register 40065.

For example: Writing 1 to BIT1 of Register 40065 results in Counter 1 value being captured to Counter Capture 1. Writing 1 to BIT2 of Register 40065 results in Counter 2 value being captured to Counter Capture 2. Writing 1 to BIT3 of Register 40065 results in Counter 3 value being captured to Counter Capture 3. etc.

### 4.1.5.5 Capture Counter Registers:

Capture counter registers display counter values which are stored in non volatile memory.

### 4.1.5.6 Counter Zero:

Initial value of counter during power ON condition is controlled by counter zero registers. To ensure that a counter initial value is zero, a 1 must be written to the corresponding bit position in the Capture Zero Register 40070 otherwise initial value of counter is value of capture counter registers which is stored in non volatile memory.

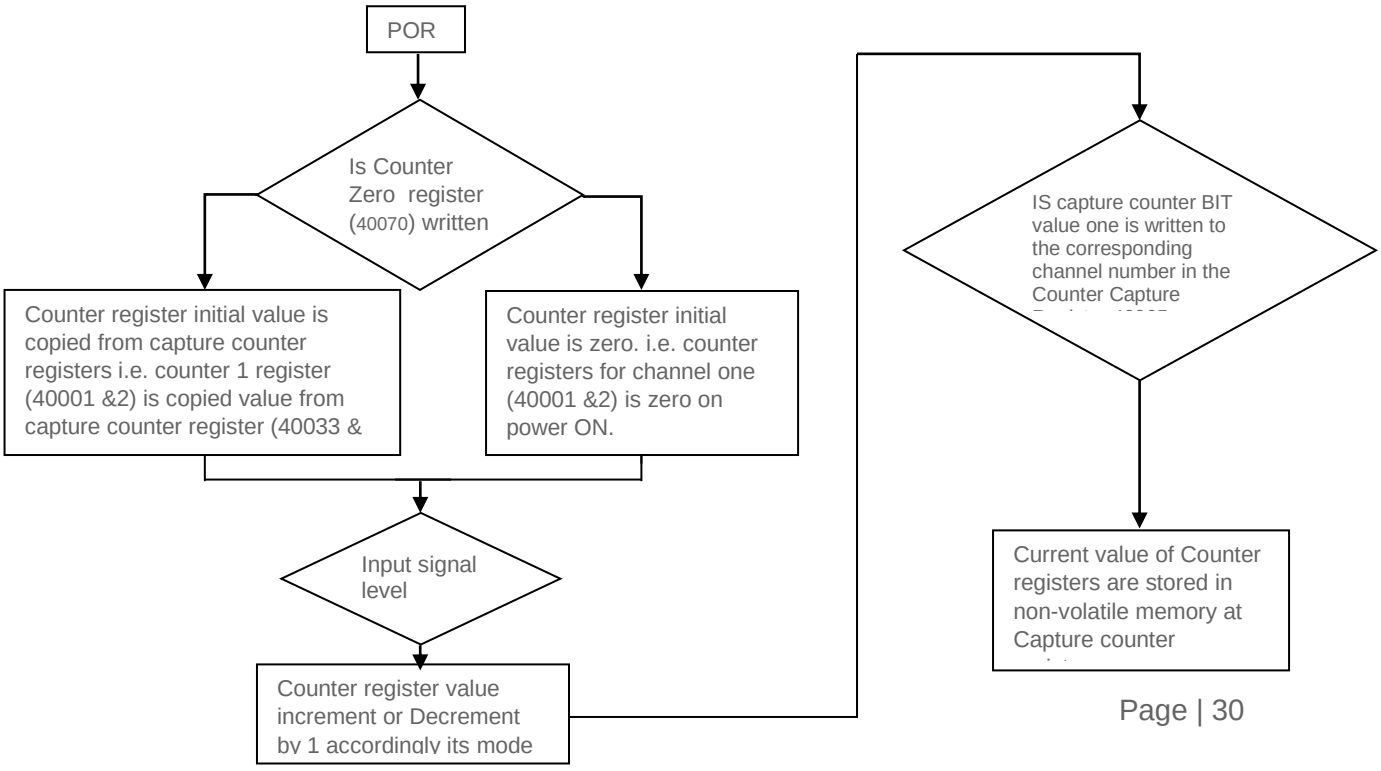
**For example:** Writing 1 to BIT1 of Register 40070 results in Counter 1 starts counting from zero value on power ON module.

Writing 1 to BIT2 of Register 40070 results in Counter 2 starts counting from zero value on power ON module, etc.

Writing 0 to respective BIT position means particular counter starting from captured value.

The value in the Capture Zero Register 40070 is permanently stored in Memory and only has to be configured once.

**Flow chart of Counter function:**

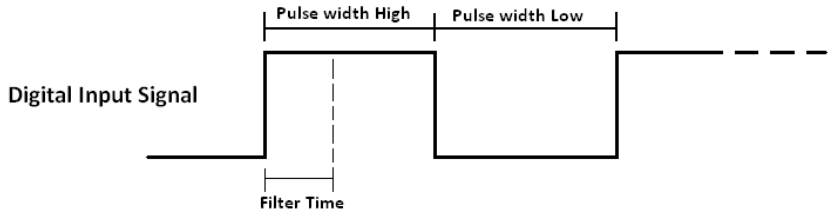


### 4.1.5.7 Filter Time (ms):

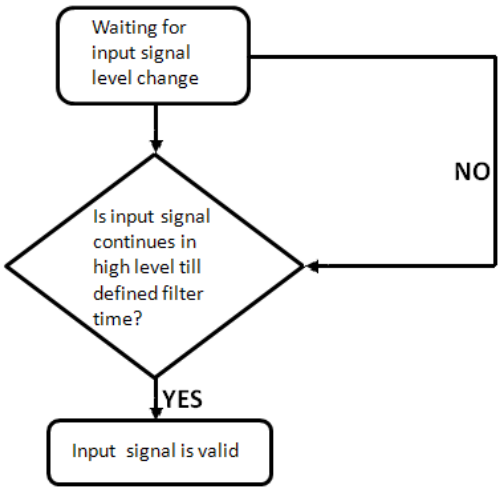
The Filter Time is the length of time that a newly changed input to some channel should last for before it is accepted as a valid input.

It is used to eliminate input noise. If the filter time is zero then there is no filter on this channel. Maximum writable frequency is 65535 mSec.

The factory default value is “0ms”.

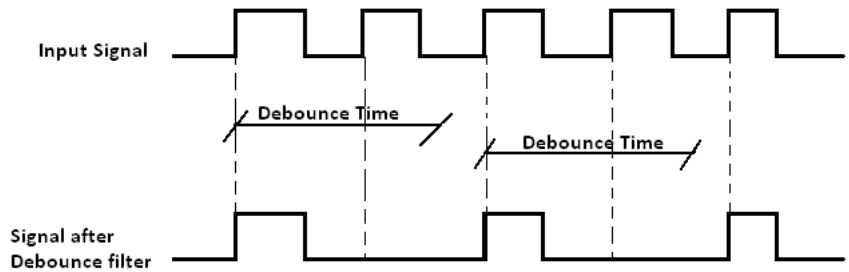



**Flowchart:**




### 4.1.5.8 Debounce Time (ms):

Debouncing can be applied for all input functions and prevents the processing of fast input state changes, like those caused by contact bouncing. Signal changes are ignored according to the filter type and time applied. This filter time values range from 0 ...65535 milliseconds; a 0 value deactivates Debounce filtering. The selection of Debounce filter time write registers 40067.




### 4.1.5.9 Chatter Mode Count:

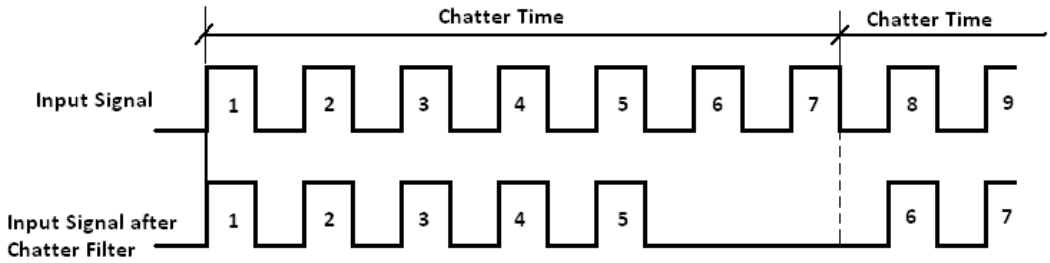
Only applies to event & counter inputs. It limits the number of registered events to a configurable count during a configurable time. The goal is to

prevent multiple event registrations for the same input, e.g. a disturbance interfering with a slow changing input (perhaps the comparator hysteretic was chosen to be too small). The chatter counter is configurable for individual inputs, chatter time for each input pair. Chatter filtering for individual inputs can still be disabled by 0 chatter count values.

**Chatter time:** The time period within which the chatter counter limit is effective. Value Range from 1 ... 65535 milliseconds.

**Chatter count:** The maximum number of registered events allowed passing within the chatter time period. Values range from 1 ... 250, a 0 value deactivates chatter filtering.

Example: If chatter time is configured and chatter counts are 5 counts.




Note: *Warning Chattering is a mighty processing tool which may cause Undesirable side effects. Its application to counter inputs is especially questionable*.

### 4.1.6 Modbus Address for configuration

| Parameter | Address | Description |
|---|---|---|
| **DI latch** | 00001 to 00016(high)<br>00017 to 00032(Low) | Channels 1 to 16 DI latch coils. For “latch on high” or “latch on low” function. |
| **DI Status Bits** | 10001 to 10016 | Digital Inputs status. 1-16. |
| **Counter Registers (Read Only)** | 30001 to 30032 | Channels 1 to 16 counter. Unsigned 32-bit integers (swap long). Counter with range 0 to 4294967295. |
| **Counter Registers (swap long)** | 40001 to 40032 | Channels 1 to 16 counter holding registers. Unsigned 32-bit integers (swap long). Counter with range 0 to 4294967295. |

| | | |
|---|---|---|
| **Counter Capture** | 40065 | BIT1=1 to Capture Counter for CH.1, BIT2=1 to Capture Counter for CH.2, etc |
| **Capture Counter Registers (swap long)** | 40033 to 40064 | Capture Counter Registers, Channels 1 to 16 counter holding registers. Unsigned 32-bit integers (swap long). |
| **Filter Time** | 40066 | 0 = Disable, >0 = Enable. (x 1msec) |
| **Debounce Time** | 40067 | 0 = Disable, >0 = Enable. (x1ms). |
| **Chatter Time** | 40068 | 0 = Disable, >0 = Enable. (x1ms) |
| **Chatter Count** | 40069 | Chatter Count, max. 250 count |
| **Capture Zero** | 40070 | 0 = Disabled (Start From Capture Count), bit1 =1 auto zero counter 1. bit2 =1 auto zero counter 2. |
| **Counter Mode** | 40071 – 40086 | 0=Disable, 1=Up Counting, 2=Down Count for CH.1-16 |
| **DI Status Word** | 30085 | 16 channel Input State – 16 BIT. 1 = ON 0 = OFF |
| **Counter Starts from stored value during power OFF.** | 40087 | 0 = Disabled (counter start depends on Capture Zero bit selection), bit1 =1 start from power off counter value 1. bit2 =1 start from power off counter value 2. |

## 4.2 mINT – 16DO – Digital Outputs:

### 4.2.1 Description:

This module has 16 open collector (NPN (Sink) & PNP (Source)) digital outputs. The outputs may be used to drive Lamps or external relays when more drive capability is required. The outputs are isolated from the logic and they share a common negative terminal. We can configure this module with mINT Plus configuration software or any Modbus Master device.

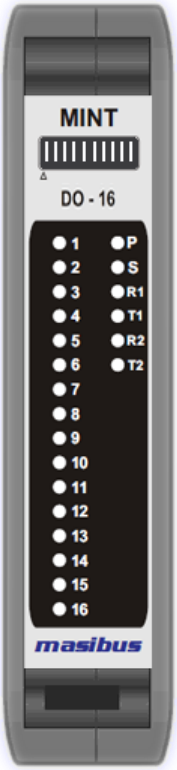
This module has four output configuration modes:

- Normal Output Mode:
- Single Pulse Output Mode:
- Continuous Pulse Output Mode:

### 4.2.2 Technical Specifications:

| Voltage Requirements: | |
|---|---|
| Logic Supply voltage | 18 - 32Vdc |
| Logic Supply Current | 120mA max @ 24V |
| Power Consumption | <3W |
| Field Supply voltage | 24 Vdc ± 10% |
| Field Supply Current | <1 A, Note: The user should limit the output current of the module to less than 1A, so the power dissipation for the field is less than 24W. |
| **Output Specifications:** | |
| Output Points | 16 (Sink or Source)(Factory Selectable) |
| Pre-Define Value | ON, OFF |
| Output type | Discrete output, Single & Continuous pulse |
| Pulse Width (High + Low) | Configurable(10 mSec to 5 Sec) |
| Maximum Current | 100mA per Output<br>(total current for output No.1 to 8 <500mA )<br>(total current for output No.9 to 16 <500mA ) |
| Vce ON | 1.1V max |
| Isolation | 1500Vrms – Field To Logic |
| Isolation | 1500Vrms – Field To RS485 |
| Isolation | 1500Vrms – RS485 To Logic |
| **Environmental Specifications:** | |
| Operating Temperature | 0˚ C to 55˚ C |
| Storage Temperature | -10˚C to 70˚ C |
| Humidity (Non-condensing) | 30 to 95% RH |
| **Communication Specifications:** | |
| Communication Port | 2 COM ports |
| Communication Interface | Based on EIA RS-485. |
| Communication Speed(Baud rate) | 9600, 19200, 38400, 57600,115200 bps. |
| Parity | ODD, EVEN ,NONE |
| Data bits | 8 |
| Stop bit | 1, 2 |
| Communication Protocol | Modbus RTU |

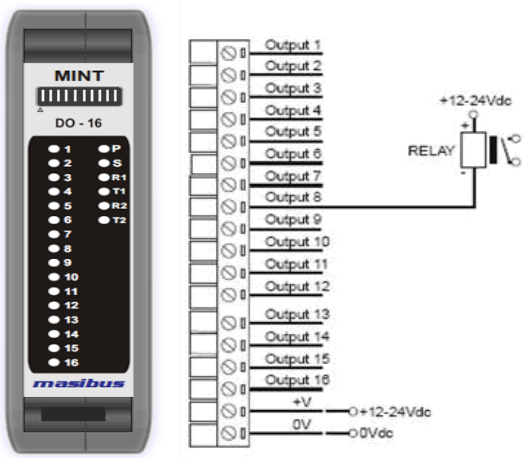
### 4.2.3 Status Indicators



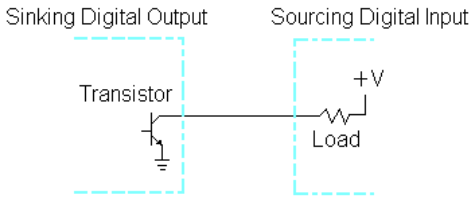

- Power: "ON" When Logic Supply is "ON"
- Module Status: "ON" When CPU is Running
- RS 485 RX1- RX2: Flashes when Modbus queries are receiving
- RS 485 TX1- TX2: Flashes when transmitting Modbus response
- Output Status: "ON" when Output is "ON"
  "OFF" when Output is "OFF"

### 4.2.4 Wiring Diagram:

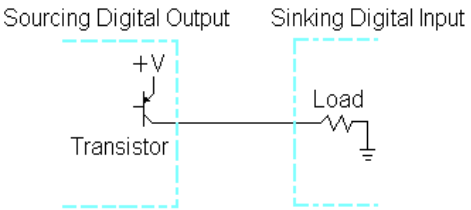
The following diagram shows how the digital outputs are connected to the coil of a relay. (Typical Output Diagram)




Equivalent Circuit Diagram: Sink Output (0V)




Equivalent Circuit Diagram: Source Output (+24V)




### 4.2.5 Configurable Parameters

Using mINT PLUS the following attributes can be configured to suit the required operation of this Module.

#### 4.2.5.1 Predefine Value:

This parameter is the value set to each channel on power-up of the module, e.g. “1” or “0”. This Value is user defined and can be configured for each channel. This parameter can have the following

**Values**: **0, 1**

The factory default is “0” for this parameter.

### 4.2.5.2 Type of Channel:

This parameter enables the user to configure the channel output type. The user configurable options are:

**Discrete Output:**

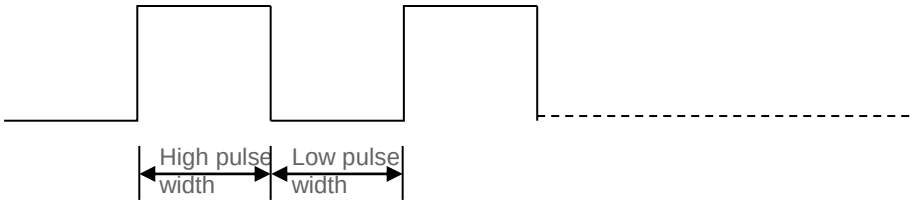
The channel output will remain constant as the controller requires.

**Single Pulse:**

When working in single pulse mode, “1” means starting a high level period which is defined in the Pulse Width parameter. When a high level period time expires the Output will stay low. “0” means canceling the last starting action. Before starting the next Single pulse a canceling “0” is required.


**Continuous Pulse:**

When working in continuous pulse mode, ‘1’ means starting a continuous pulse train, the High and low level lengths of which are defined in Parameters. ‘0’ means canceling the last Starting action. The factory default is “Discrete Output” for this parameter.




### 4.2.5.3 Pulse Width of Channel

This parameter is used to define the pulse width in conjunction with the “Type of channel” parameter. When the Single Pulse or the Continuous Pulse option is set, the high width and low width are configured separately. The unit is 10ms. 1 - 500 the factory default is “500” for this parameter. The user configurable parameters are: **1– 500.**

Example: If pulse width register value is written 1 count than Digital Output signal’s pulse width is 10ms accordingly 1 x 10ms. If pulse width count is written 2, then output signal pulse width is 20ms.

### 4.2.6 Modbus Address for configuration:

| Parameter | Address | Description |
|---|---|---|
| **Digital Output** | 00001 – 00016 | Channel 1 – 16 DO Coils<br>1 = Set to ON<br>0 = Reset to OFF |
| **Line State** | 10001 – 10016 | 16 channel line State<br>1 = Connected 0 = Disconnected |
| **Channel Type** | 40001 – 40016 | Channels 1 – 16 types:<br>0 = Normal ,1 = Single Pulse<br>2 = Continuous pulse |
| **DO predefine value** | 40017 | Channel 1 – 16<br>BIT 1 to BIT 16 , 1 – ON 0 – OFF |
| **DO – Pulse High level Time** | 40021 – 40036 | Channel 1 – 16 high level time in ms. 1-500 (x 10msec) |
| **DO – Pulse Low level Time** | 40037 – 40052 | Channel 1 – 16 low level time in ms. 1-500 (x 10msec) |
| **DO Pulse Predefined Value** | 40053 to 40068 | Channels 1 to 16 pulse Predefined value.<br>In “Continuous Pulse” mode, after the pulse value reached this predefined value; the output will be forced to OFF.<br>If this value is zero, the pulse Output will be unlimited. |
| **DO Pulse Predefined Value Reset** | 40020 | Channel 1 – 16, BIT 1 to BIT 16<br>1 – Reset |
| **Channel Type** | 30001 – 30016 | Read Only |
| **DO predefine value** | 30017 | Read Only |
| **DO – Pulse High level Time** | 30021 – 30036 | Read Only |
| **DO – Pulse Low level Time** | 30037 – 30052 | Read Only |
| **DO Pulse Value** | 30053 to 30068 | Read Only |
| **DO Pulses** | 30069 to 30084 | Channels 1 to 16 – number of output pulses as per the Predefined value defined in DO pulse Predefined value |
| Line State - Word | 30085 | 16 channel line State – 16 BIT<br>1 = Connected 0 = Disconnected |

## 4.3 mINT – 08AI – Analog Inputs

### 4.3.1 Description:

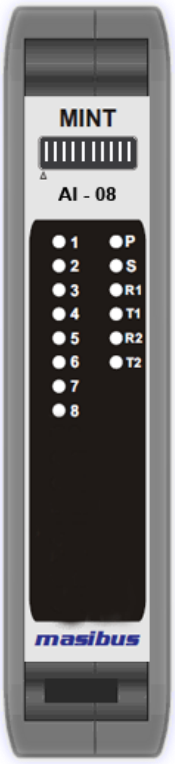
This module is supplied with Thermocouple, RTD, Voltage and current Inputs. All 8 channels are supplied with user selectable universal Inputs. We can configure this module with mINT Plus configuration software or any Modbus Master device. All user Zero values and Span values of connected sensors are configurable through the mINT Plus Software.

### 4.3.2 Technical Specifications:

| Voltage Requirements: | |
|---|---|
| Logic Supply voltage | 18 - 32Vdc |
| Logic Supply Current | 100mA max @24V |
| Power Consumption | <3W |
| Field components | 50 ohms connected externally for Current inputs |
| **Input Specifications:** | |
| Input Points | 08 |
| Input Types | Thermocouple -> E ,J ,K ,T ,B ,R ,S ,N |
| | RTD -> Pt100, Cu-53, NI-120 |
| | Current -> 0-20mA , 4-20mA |
| | Resistor Input -> 0 Ohms to 2k Ohms |
| | Voltage -> -10V to +10V,<br>-100mVto+100mV,<br>-50mVto+50mV,<br>-250mVto+250mV |
| Isolation | 1500Vrms – Field To Logic |
| Isolation | 1500Vrms – Field To RS485 |
| Isolation | 1500Vrms – RS485 To Logic |
| Resolution | 16 Bit ADC |
| CMRR/NMRR | CMRR>120dB NMRR>60dB at 50Hz |
| Accuracy | 0.1% of FS |
| Temperature Drift | ≤ 0.01% of span/°C |
| CJC Error | ±2°C (0 to 55°C) |
| Input Impedance | V>1 MΩ, mA<100Ω, mV/TC>1 MΩ |
| Sensor Burn-out Current | 0.5uA |
| RTD Excitation Current | 250uA |
| Scan Rate | T/C & Voltage/Current:<br>50mSec/Channels<br>RTD: 100mSec/Channels |
| **Environmental Specifications:** | |
| Operating Temperature | 0˚ C to 55˚ C |
| Storage Temperature | -10˚C to 70˚ C |
| Humidity (Non-condensing) | 30 to 95% RH |

| Communication Specifications: | |
|---|---|
| Communication Port | 2 COM ports |
| Communication Interface | Based on EIA RS-485. |
| Communication Speed(Baud rate) | 9600, 19200, 38400, 57600,115200 bps. |
| Parity | ODD, EVEN ,NONE |
| Data bits | 8 |
| Stop bit | 1, 2 |
| Communication Protocol | Modbus RTU |

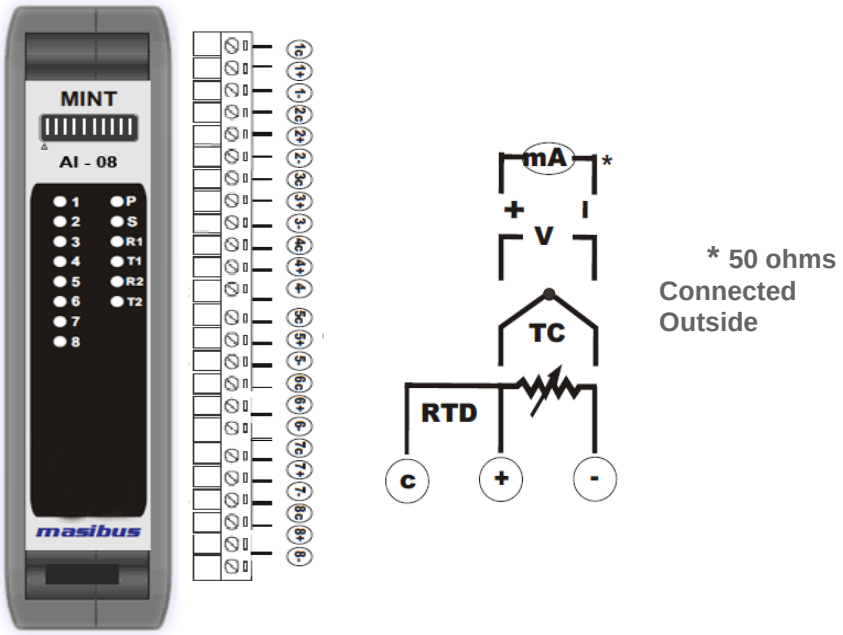
### 4.3.3 Status Indicators




- Power: "ON" When Logic Supply is "ON"
- Module Status: "ON" When CPU is Running
- RS 485 RX1- RX2: Flashes when Modbus queries are receiving
- RS 485 TX1- TX2: Flashes when transmitting Modbus response
- Input Status: "ON" when Input is "ON"
  "OFF" when Input is "OFF"

### 4.3.4 Wiring Diagram:

The following diagram shows how the Analog Inputs are connected to the Input Terminals.




### 4.3.5 Modbus Address for configuration:

| Parameter | Address | Description |
|---|---|---|
| Process Value (INT) [1] | 30001 – 30008 | Channel 1 – 8 Inputs – Read Only |
| Process Value (Swap Float) [1] | 30051 – 30065 | Channel 1 – 8 Inputs – Read Only |
| Ambient Temperature (INT) | 30009 | Ambient Temperature Read Only |
| Ambient Temperature (Swap Float) | 30067 | Ambient Temperature Read Only |
| Input Types [2] | 40001 – 40008 | Channel 1 – 8 Input Types |
| User Zero Range | 40073 – 40080 | Channel 1 – 8 Input User Zero |
| User Span Range | 40097 – 40104 | Channel 1 – 8 Input User Span |
| Calibration Ambient | 40249 | Ambient Temperature Calibration (0°C – 55.0°C) |

*** Calibration is used for factory purpose, these parameters are not recommended to use on field.**

| Type Description | Resolution | Accuracy | Type Description | Resolution | Accuracy |
|---|---|---|---|---|---|
| E - Type TC | 0.1°C | +/- 0.5°C | Pt-100 3W | 0.1°C | +/- 1°C |
| J - Type TC | 0.1°C | +/- 0.5°C | CU-53 | 0.1°C | +/- 1°C |
| K - Type TC | 0.1°C | +/- 0.5°C | NI 120 | 0.1°C | +/- 1°C |
| T - Type TC | 0.1°C | +/- 0.5°C | resistance | 1 Ω | +/- 0.01% |
| B - Type TC | 1°C | +/- 1°C | | | |
| R - Type TC | 1°C | +/- 1°C | Current | 1uA | +/- 0.05% |
| S - Type TC | 1°C | +/- 1°C | Voltage +/-1V | 0.1mV | +/- 0.01 % |
| N - Type TC | 1°C | +/- 1°C | Voltage +/-10V | 1mV | +/- 0.01 % |

**Note:**

### [1] *Abnormal Conditions of Process Value*

| Abnormal Value | Description |
|---|---|
| 32764 | Channel Skip |
| 32765 | UNDER Value |
| 32766 | OVER Value |
| 32767 | Channel OPEN Indication |

### [2] *Input Type Descriptions*

| Value | Type Description | Modbus Ranges | Input Range |
|---|---|---|---|
| 0 | Channel OFF ( Skip ) | NA | NA |
| 1 | E - Type TC | -2000 to 10000 | -200°C to 1000°C |
| 2 | J - Type TC | -2000 to 12000 | -200°C to 1200°C |
| 3 | K - Type TC | -2000 to 13500 | -200°C to 1350°C |
| 4 | T - Type TC | -2000 to 4000 | -200°C to 400°C |
| 5 | B - Type TC | 4500 to 18000 | 450°C to 1800°C |
| 6 | R - Type TC | 0 to 17500 | 0°C to 1750°C |
| 7 | S - Type TC | 0 to 17500 | 0°C to 1750°C |
| 8 | N - Type TC | -2000 to 13000 | -200°C to 1300°C |
| 9 | Pt-1003W | -2000 to 8500 | -200°C to 850°C |
| 10 | CU-53 | -2100 to 2100 | -210°C to 210°C |
| 11 | NI 120 | -800 to 2100 | -80°C to 210°C |
| 12 | Current | -2000 to +20000 | 0.000 to 20.000mA |
| 13 | Current | -2000 to +20000 | 4.000 to 20.000mA |
| 14 | resistance | 0 to 2000 | 0Ω to 2000Ω |
| 15 | Voltage | -2000 to +20000 | -10mV to +50mV |
| 16 | Voltage | -2000 to +20000 | 0 to +100mV |
| 17 | Voltage | -2000 to +20000 | 0 to +250mV |
| 18 | Voltage | -2000 to +20000 | 0 to +1V |
| 19 | Voltage | -2000 to +20000 | 0 to +10 V |

## 4.4 mINT – 08AO – Analog Output

### 4.4.1 Description:

This module is supplied with 0/4mA – 20mA or 0/2-10Vdc analog output. All 8 channels are supplied with Fixed type of analog Outputs either current or voltage.

We can configure this module with mINT Plus configuration software or any Modbus Master device.

All user Zero values and Span values of connected load are configurable through the mINT Plus Software.

### 4.4.2 Technical Specifications:

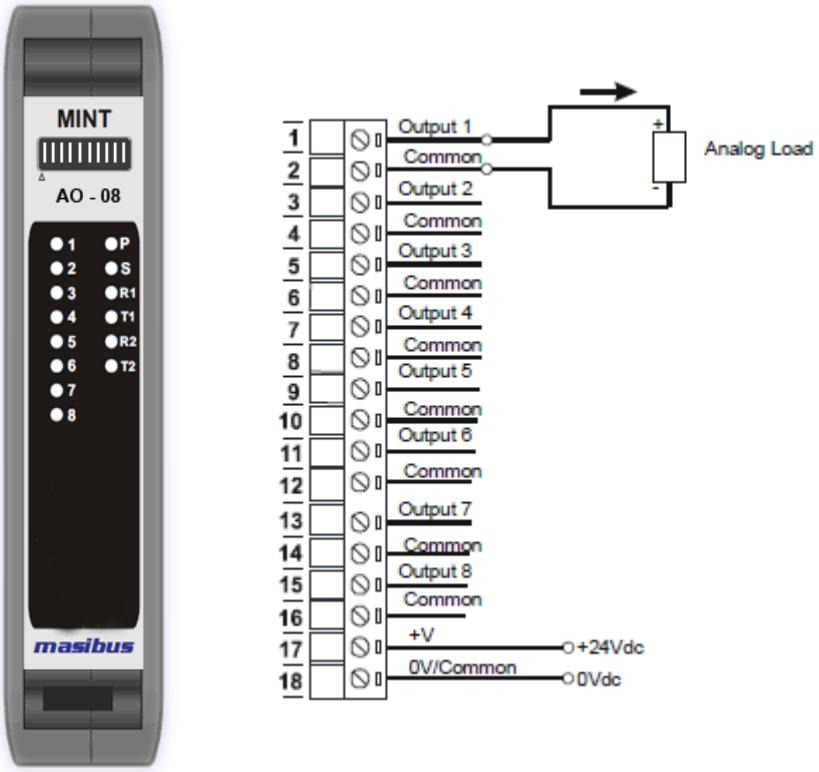
| **Voltage Requirements:** | |
|---|---|
| Logic Supply voltage | 18 – 32Vdc |
| Logic Supply Current | 100mA max @24V |
| Power Consumption | <3W |
| Field Supply voltage | 24 VDC |
| Field Supply Current | 250mA max |
| **Output Specifications:** | |
| Output Points | 08 |
| Output Types – Factory Set | Current -> 0-20mA / 4-20mA |
| | Voltage -> 0-10Vdc/2-10Vdc |
| Isolation | 1500Vrms – Field To Logic |
| Isolation | 1500Vrms – Field To RS485 |
| Isolation | 1500Vrms – RS485 To Logic |
| Resolution | 16 Bit DAC |
| Accuracy | 0.05% of span |
| Scan Rate | < 200mSec |
| Temperature Drift | ≤ 0.01% of span |
| Load ( Compliance ) | For Current :750 Ω max.@ 24V DC<br>For Voltage : 2000 Ω min. |
| **Environmental Specifications:** | |
| Operating Temperature | 0˚ C to 55˚ C |
| Storage Temperature | -10˚C to 70˚ C |
| Humidity (Non-condensing) | 30 to 95% RH |
| **Communication Specifications:** | |
| Communication Port | 2 COM ports |
| Communication Interface | Based on EIA RS-485. |
| Communication Speed(Baud rate) | 9600, 19200, 38400, 57600,115200 bps. |
| Parity | ODD, EVEN ,NONE |
| Data bits | 8 |
| Stop bit | 1, 2 |
| Communication Protocol | Modbus RTU Slave |

### 4.4.3 Status Indicators

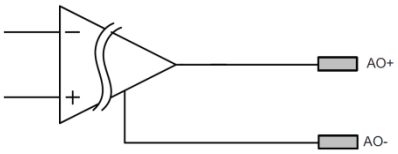

- Power: "ON" When Logic Supply is "ON"
- Module Status: "ON" When CPU is Running
- RS 485 RX1- RX2: Flashes when Modbus queries are receiving
- RS 485 TX1- TX2: Flashes when transmitting Modbus response
- Output Status: "ON" when Output is "ON"
  "OFF" when Output is "OFF"

### 4.4.4 Wiring Diagram:

The following diagram shows how the Analog Outputs are connected to the Output Terminals.




Equivalent Circuit Diagram:




### 4.4.5 Modbus Address for configuration:

| Parameter | Address | Description |
|---|---|---|
| **Process Value (INT)** | 30001 – 30008 | Channel 1 – 8 Outputs – Read Only |
| **Process Value (Swap Float)** | 30051 – 30065 | Channel 1 – 8 Outputs – Read Only |
| **Ambient Temperature (INT)** | 30009 | Ambient Temperature Read Only |
| **Ambient Temperature (swap Float)** | 30067 | Ambient Temperature Read Only |
| **Output Types** [1] | 40001 – 40008 | Channel 1 – 8 Output Types |
| **Output** | 40009 – 40016 | Channel 1 – 8 Output Apply – 16 Bit |
| **Output Status** | 40017 | Output Status Register |
| **Calibration Ambient** | 40249 | Ambient Temperature Calibration (**0**°C – 55.0°C) |

*** Calibration is used for factory purpose, these parameters are not recommended to use on field.**

| Type Description | Accuracy | Resolution |
|---|---|---|
| 0/4mA – 20mA | +/- 0.05% | 16 BIT |
| 0/2VDC – 10VDC | +/- 0.05% | 16 BIT |

**Note:**

***[1] Output Type Descriptions***

| Value | Type Description | Modbus Ranges | Input Range |
|---|---|---|---|
| 0 | Channel OFF ( Skip ) | NA | NA |
| 1 | 0-20 mA | 0 to 20000 | 0.000mA to 20.000mA |
| 2 | 4-20 mA | 4000 to 20000 | 4.000mA to 20.000mA |
| 3 | 0-10 VDC | 0 to 10000 | 0.0V to 10.0V |
| 4 | 2-10 VDC | 2000 to 10000 | 2.0V to 10.0V |

# 5. MINT- PLUS CONFIGURATION SOFTWARE

Mint-PLUS is PC software used for configuration and Calibration of the IO module, Read IO status directly in PC, Force Outputs to test the module and used as tool for module diagnostic purpose.

For more information about MINT-PLUS configuration software prefer MINT-PLUS CONFIGURATION TOOL USER GUIDE (REF NO: m25Aom/201).

## 5.1 Diagnostics Information:

| Parameter | Address | Description |
|---|---|---|
| **COM 1 State** | 32001 | 0: no error and using;<br>1: not to be used; |
| **COM 2 State** | 32002 | 0: no error and using;<br>1: not to be used; |
| **Software Version** | 32021, 32022 | 4 unsigned 8-bit integers |
| **Parameters Version** | 32023, 32024 | 4 unsigned 8-bit integers |
| **Software Type** | 32025 | Type ID of I/O module |
| **Parameters Type** | 32026 | Type ID of Parameters |
| **Number of Requests** | 32101, 32102 | Total number of requests from the master<br>Unsigned 32-bit integer |
| **Number of Valid Responses** | 32103, 32104 | Total number of responses to the master<br>Unsigned 32-bit integer |
| **Number of Invalid Responses** | 32105, 32106 | Total number of responses to the master<br>Unsigned 32-bit integer |
| **Running Time** | 32107 – SECOND<br>32108 – MINUTE<br>32109 – HOUR<br>32110 – DAY | Time elapsed, in seconds<br>Unsigned 32-bit integer |
| **DIP Switch** | 32010 | Status of DIP Switch on Front Panel |

# 6. MECHANICAL GUIDELINES


Fig <B> Electronic equipments usually have the DIN rail mounting hook at the bottom; therefore we maintained this standard

For the MINT Series

Fig <C> How to mount the enclosure on the DIN rail: insert the upper part of the enclosure onto the DIN rail and press until

The Hook clicks itself

Fig <D> How to remove the enclosure from the DIN rail: unhook the lower part using a screw driver and lift the enclosure from the DIN rail.

## 6.1 Cable data

| | |
|---|---|
| Conductor cross section solid | Min. 0.14 mm² & Max. 1.5 mm² |
| Conductor cross section stranded | Min. 0.14 mm² & Max. 1.5 mm² |
| Conductor cross section stranded, with ferrule without plastic sleeve | Min. 0.25 mm² & Max. 1.5 mm² |
| Conductor cross section stranded, with ferrule with plastic sleeve | Min. 0.25 mm² & Max. 0.5 mm² |
| Conductor cross section AWG/kcmil | Min. 28 & Max. 16 |
| AWG according to UL/CUL | Min. 30 & Max. 14 |

# 7. APPLICATION

- Remote data acquisition
- Process monitoring
- Industrial process control
- Supervisory control
- Security systems
- Laboratory automation
- Building automation
- Product Test/Simulation in Production

The MINT I/O can also be used by end users, package vendors as well as system integrators who want to upgrade their existing systems or optimize their automation offerings.

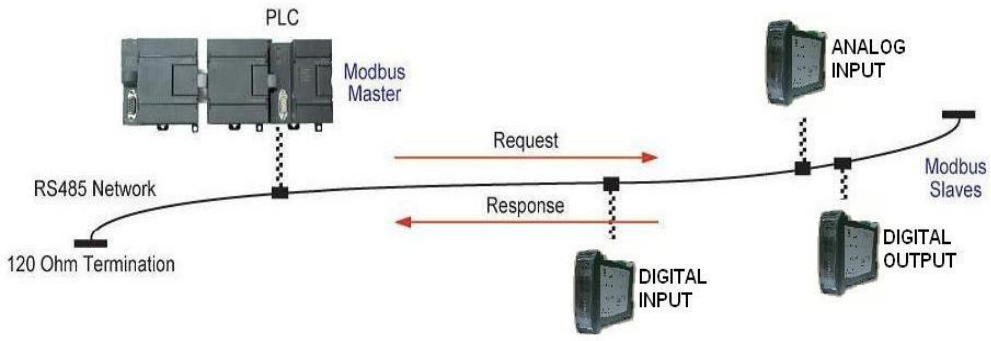
Redundant communication application where two master connections to a single device, creating redundancy in serial connectivity instantly increases reliability, uptime and accessibility for critical Industrial applications.

## 7.1 Application Configurations:

There are a number of different configurations in which the IO modules may be used in a System. Some are listed as follows:

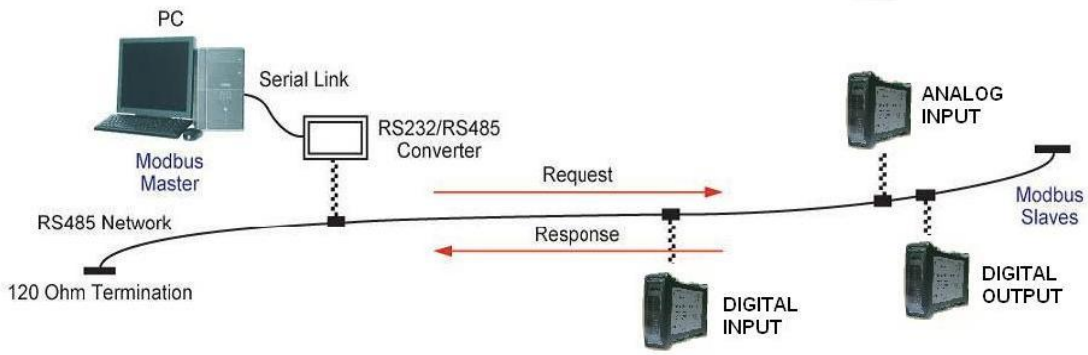
### 7.1.1 I/O Expansion:

There are a number of devices such as **PLC**'s (Programmable Logic Controllers) and **HMI** (Human machine interface) which have a MODBUS Communications facility available. Many PLC and HMI manufacturers provide Modbus Master and Modbus slave drivers to communicate directly with third party devices using Modbus protocol using different kind of hardware connection. PLC/HMI can be configured as a MODBUS Master. IO modules are attached to the RS485 network and configured as RTU slaves. The address setting is via dip switches on the IO module itself. The PLC/HMI system use mINT IO modules as remote I/O reducing cabling costs and increasing the I/O capability of the control system.



### 7.1.2 Data Acquisition:

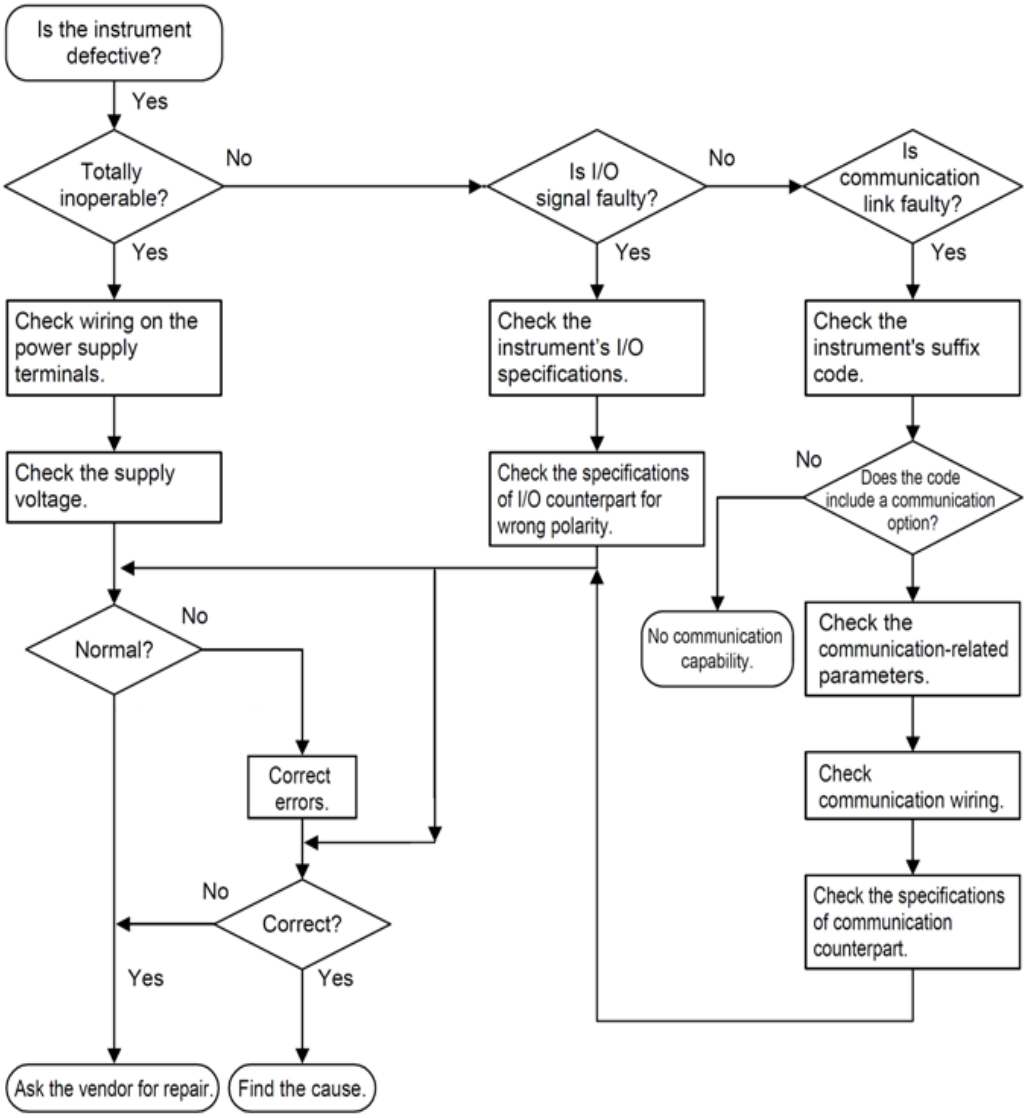
Another use of the MINT IO Modules is for Data Acquisition where a **PC** (Personal Computer) Disconnected to the Network. Many SCADA software packages support the MODBUS Master Protocol and can hence retrieve data from Input Modules or send data to Output Modules. The **serial port** of the PC is connected to an **RS232/RS485 Converter** which in turn is connected to the Network.




### 7.1.3 Communication with Common communication processor:

This all IO modules are connecting with a Common Communication processor, which are a Modbus Master and Modbus TCP\IP Slave. It collects the data of these modules and stores it. The communication processor displays this data into Ethernet network. So we can see the data at any time at any place on network. We can also configure these modules with this **CP module**. This CP module is configuring by the MINT GUI software.

## 8. TROUBLE SHOOTING

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